

A Comparison of EIT Lung Perfusion Measures

Symon Stowe¹, Alistair Boyle¹, Michaël Sage², Mathieu Nadeau²,
Jean-Paul Praud², Étienne Fortin-Pellerin², Andy Adler¹

¹Carleton University, Ottawa, Canada, ²Université de
Sherbrooke, Canada

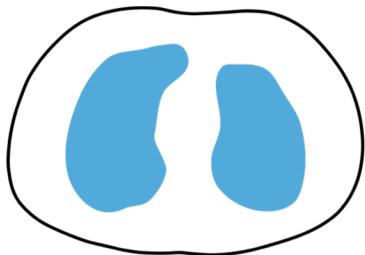
symon.stowe@carleton.ca

Why Monitor Lung Perfusion?

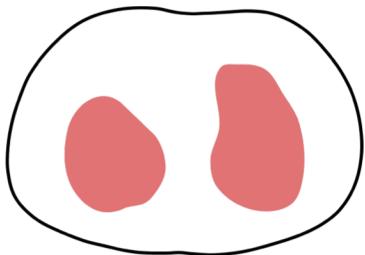
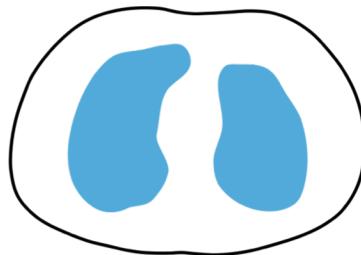
- Pulmonary embolisms are notoriously challenging to diagnose and monitor
- Mainly diagnosed using CT pulmonary angiography
 - Associated with radiation exposure and invasive administration of a contrast agent
- Clinical need to improve diagnosis and monitoring
 - Safe and low-cost method with few false positives

Perfusion/Ventilation Monitoring

Perfusion/Ventilation match



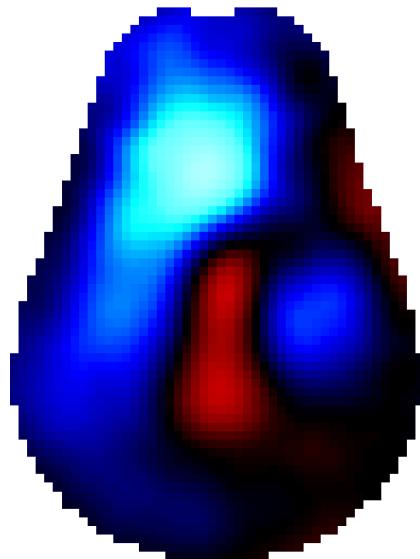
Perfusion/Ventilation mismatch



Sample sketches represent ventilation and perfusion in a human thorax

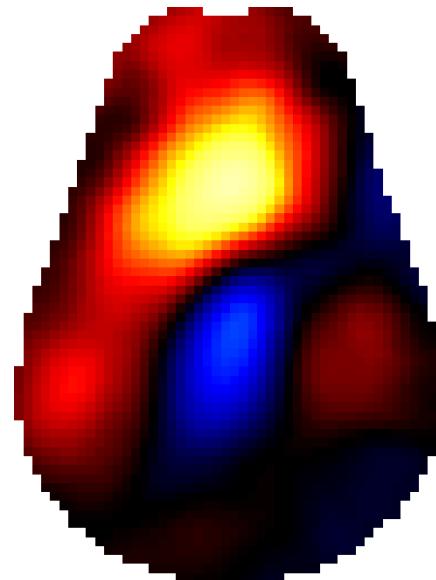
Ventilation

- Validated and reasonably well understood

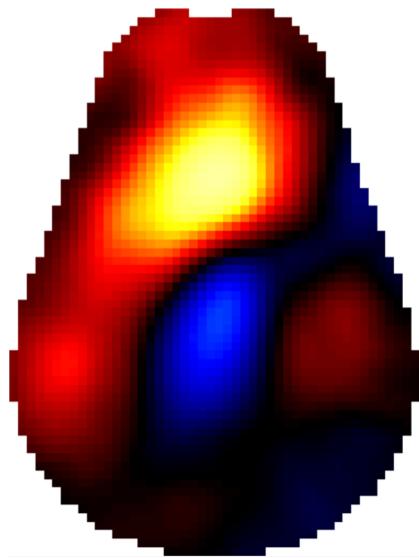


Perfusion

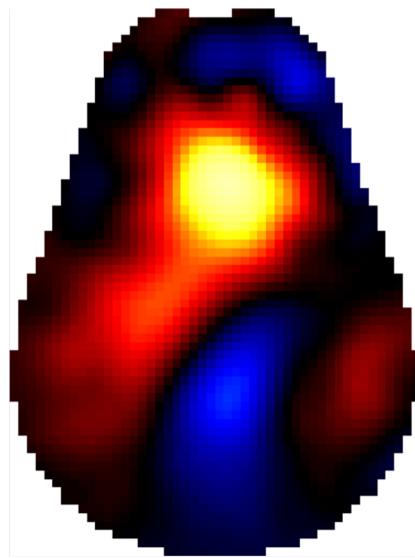
- Less understood and validated



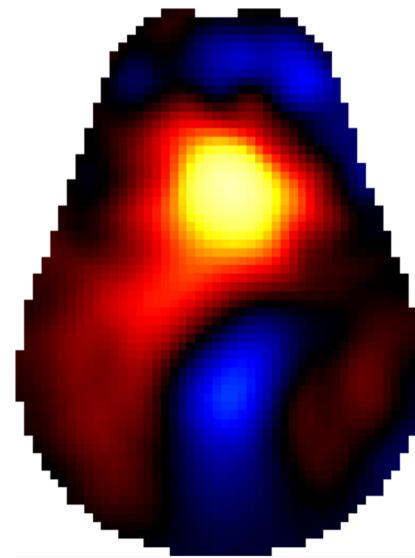
Perfusion Monitoring Techniques



Bolus Injection

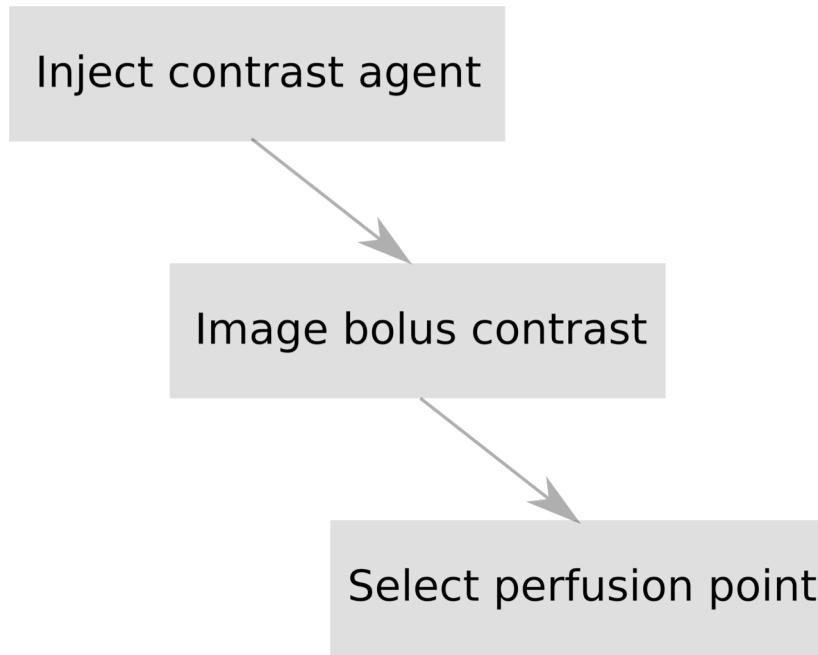


Ventilation Filtering

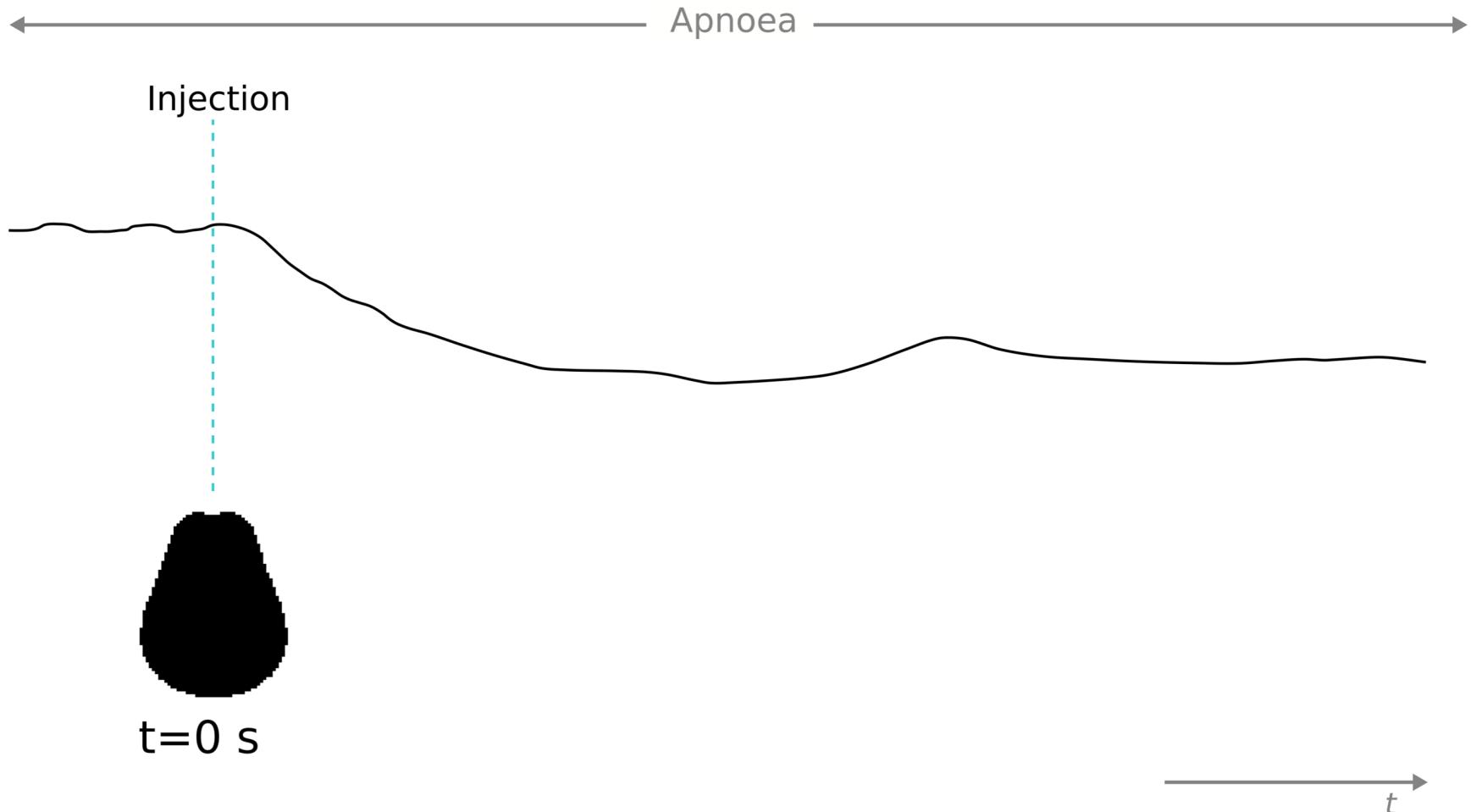


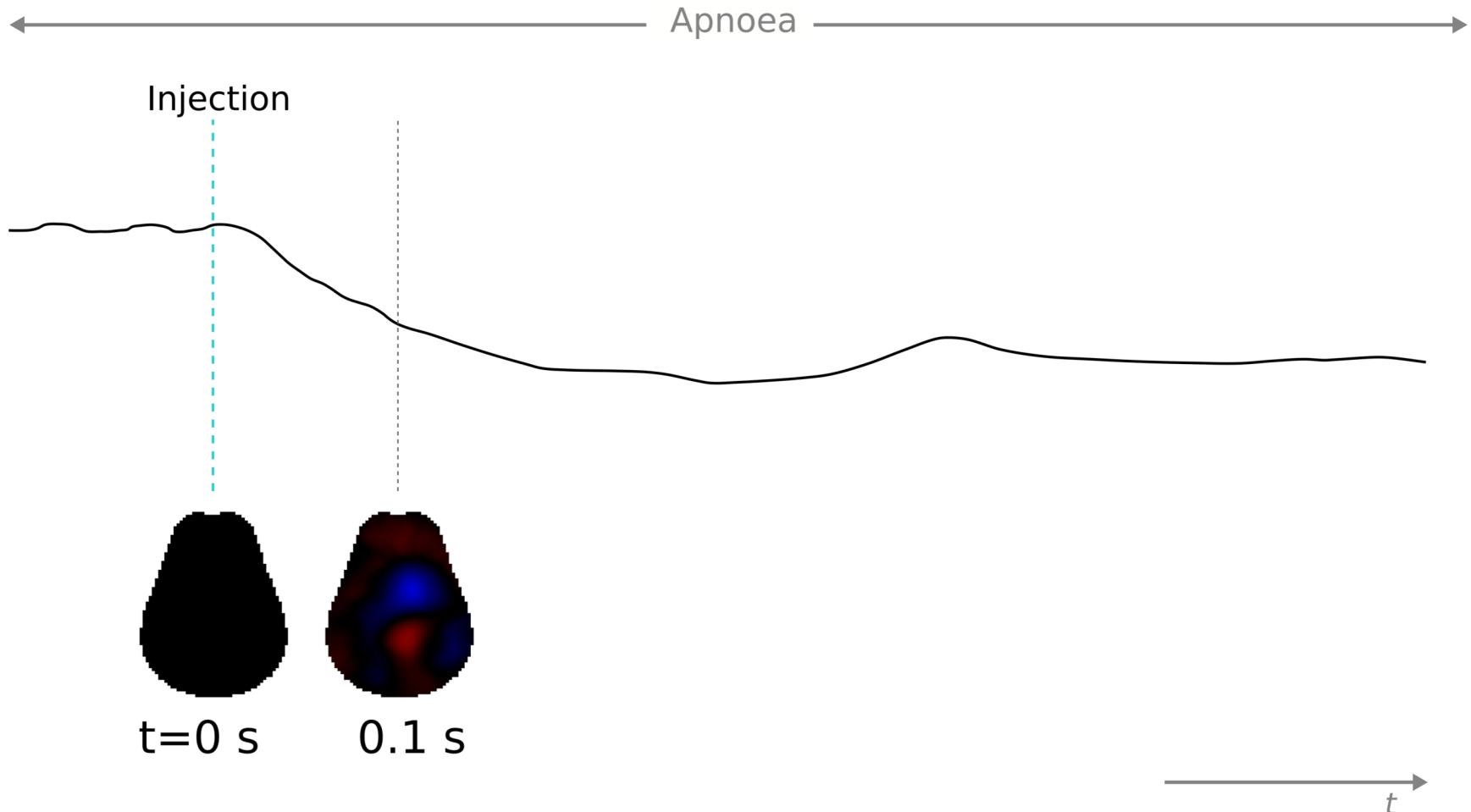
Apnoea Filtering

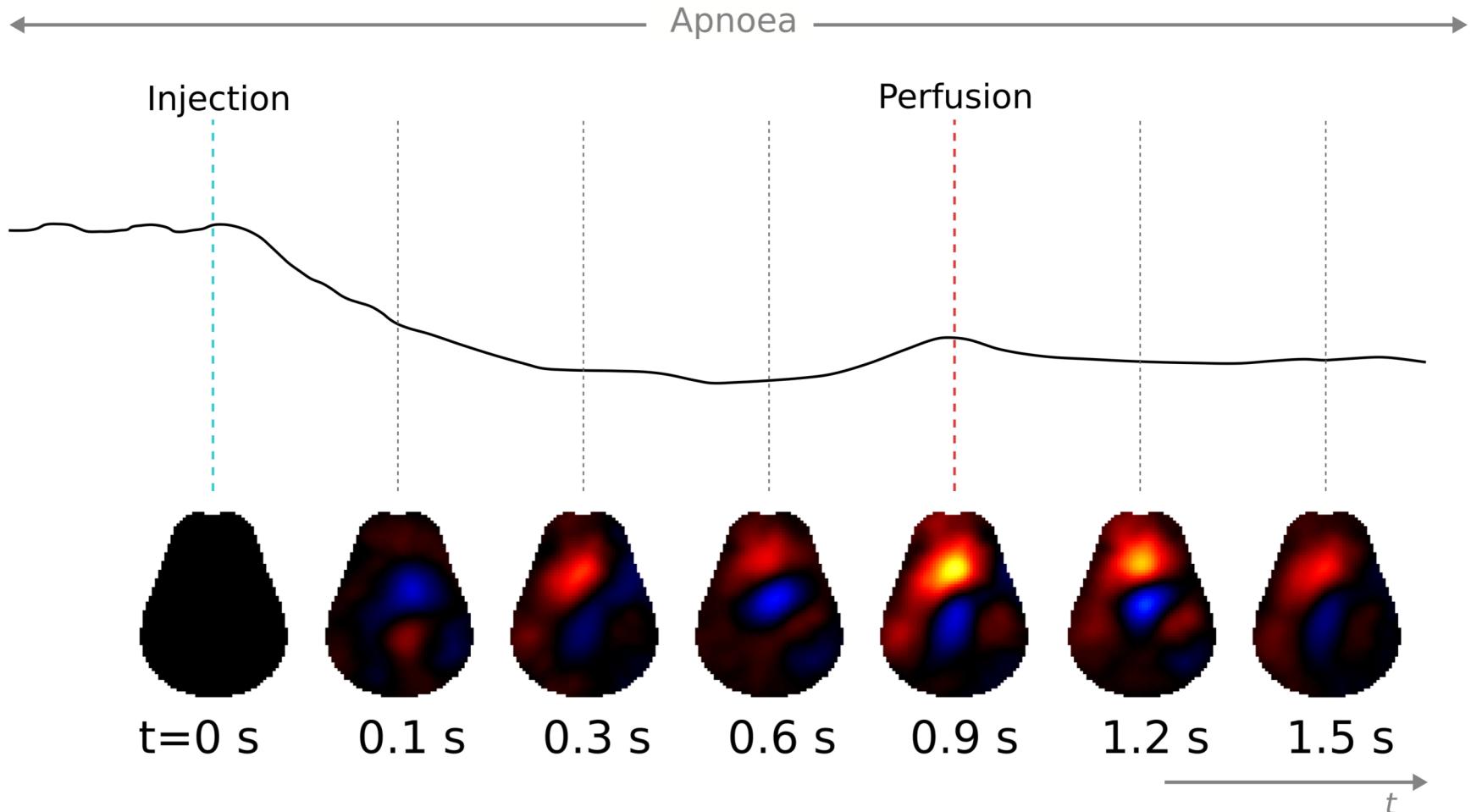
Contrast agent measures of perfusion



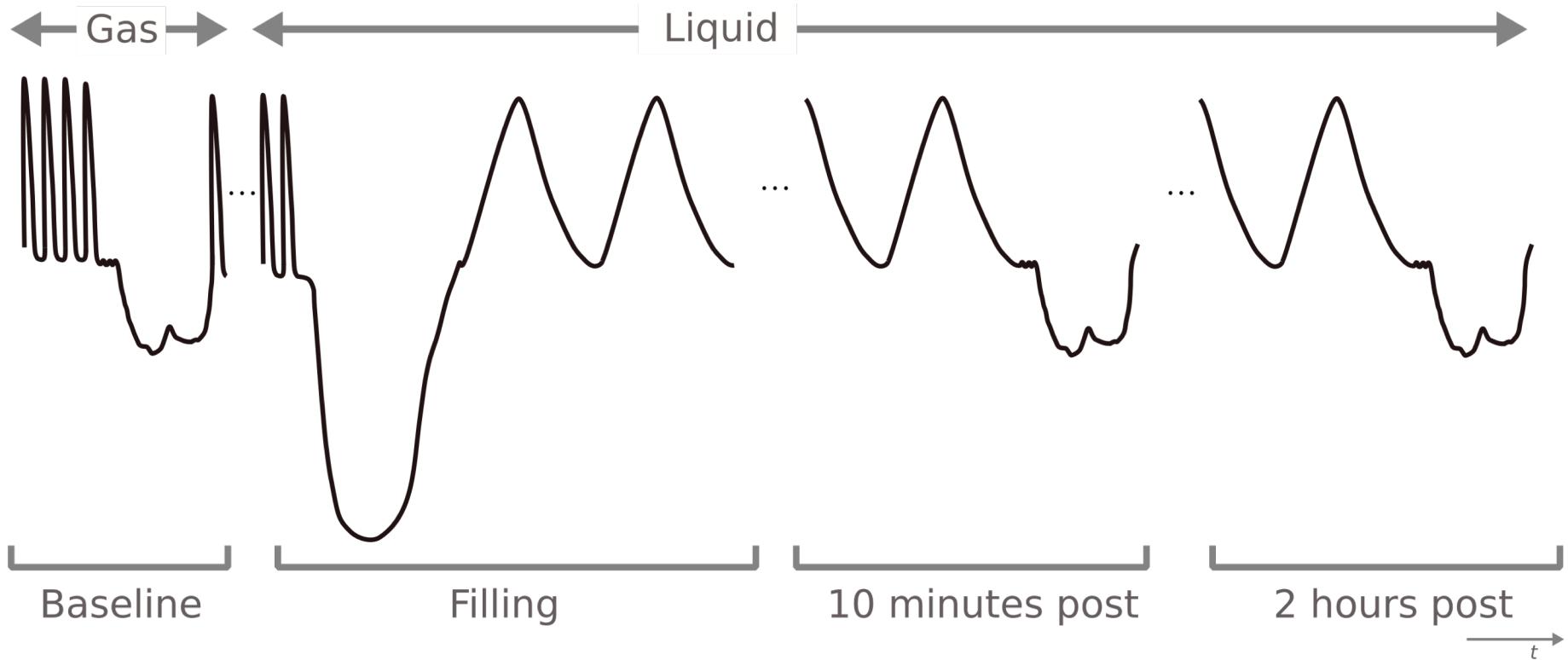
- Requires apnoea
- Non-continuous
- Invasive
- Can be performed a limited number of times
- Provides a series of blood flow images



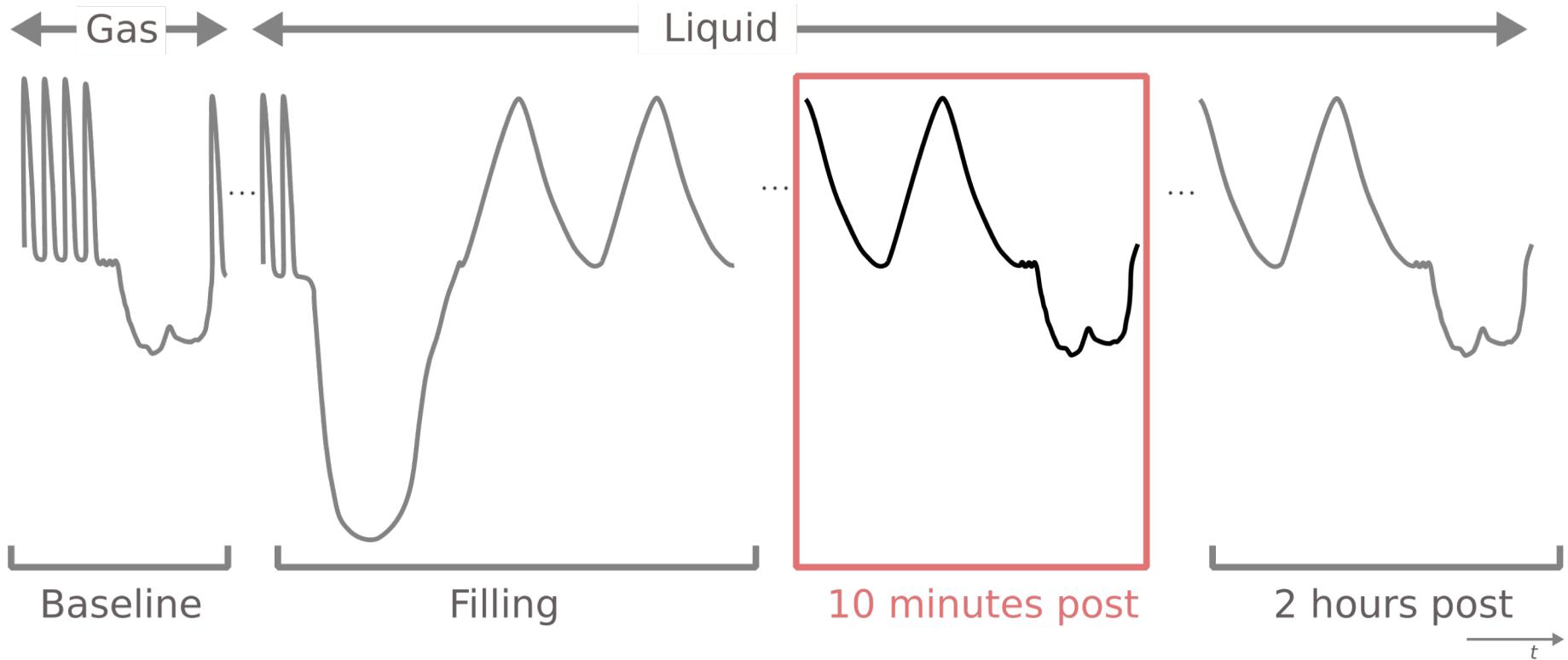




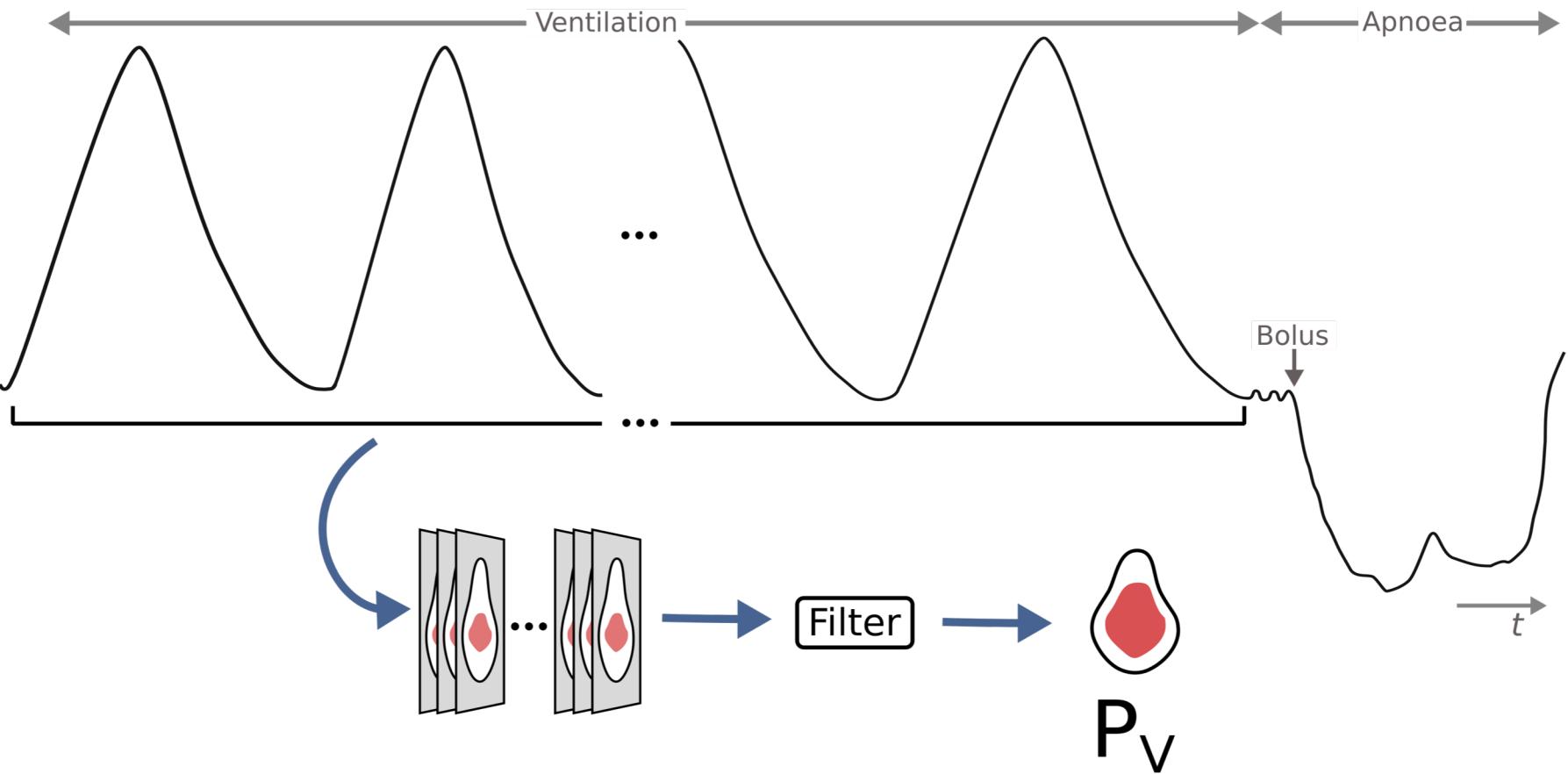
Experimental Protocol



Experimental Protocol

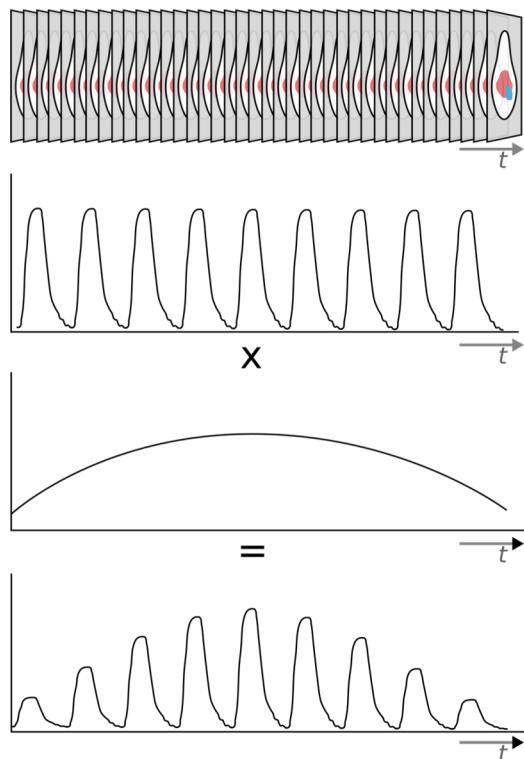


Pulsatility Analysis

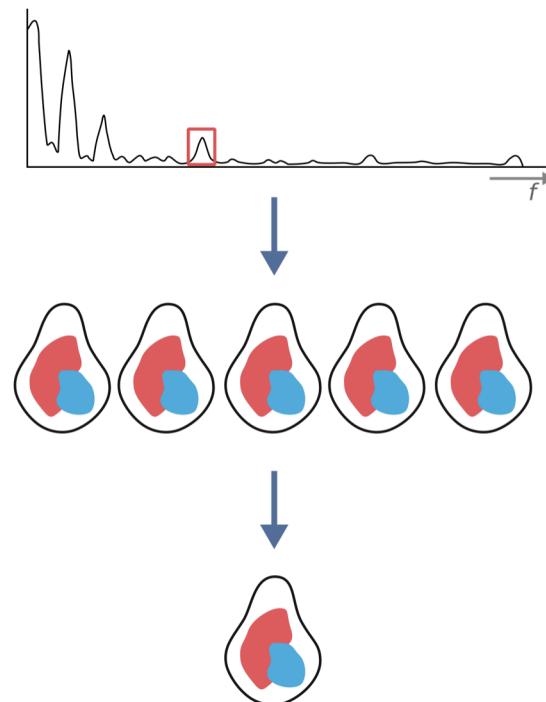


Frequency filtering technique

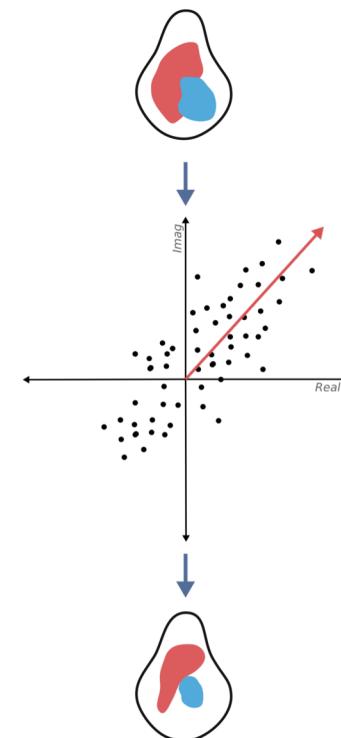
Time Domain



Frequency Domain

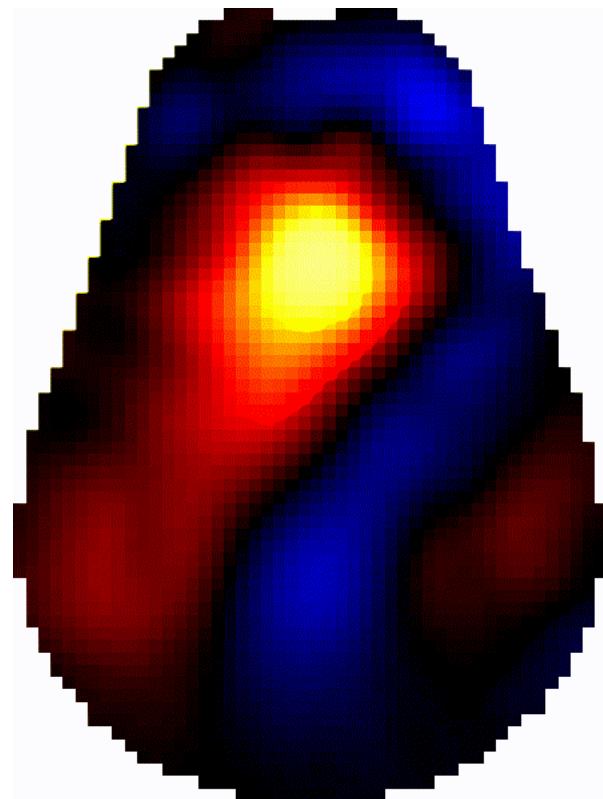


Phase Alignment



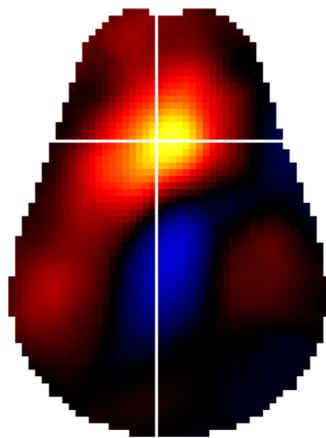
Shortcomings of Pulsatility

- Heart rate is unstable over time
- Many pixels throughout the image are out of phase
- Events at the heart rate frequency are not limited to perfusion

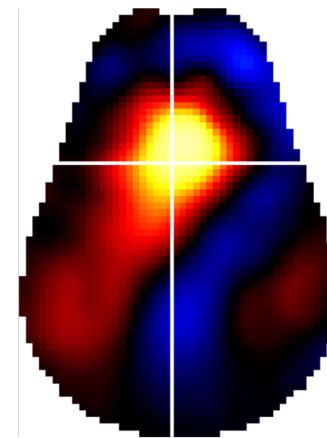


Conclusion

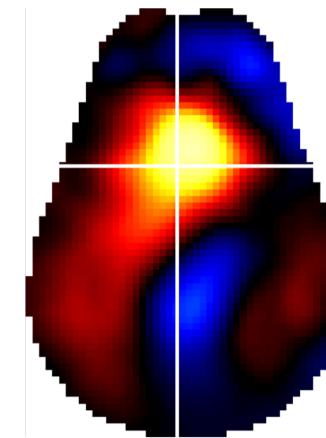
- Many challenges accurately estimating perfusion from pulsatility
- Preliminary analysis shows correlation between the three methods of perfusion measures
 - Comparing both center of mass and overall shape



Bolus Injection



Ventilation Filtering



Apnoea Filtering



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